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DECEMBER 4.

The President, Dr. LEIDY, in the chair.

Thirty-six persons present.

A paper entitled "A Study of the Distribution of Gluten within the Starch Grain," by N. A. Randolph, M. D., was presented.

Gold from North Carolina.—Prof. H. CARVILL LEWIS exhibited some remarkable gold nuggets, found in Montgomery county, North Carolina, forty miles east of Charlotte and two miles from Yadkin River. Some of the nuggets were of great size. One of them weighed over four pounds, and contained nearly $1000 worth of gold, being finer than any specimens in the collection at the Mint. It was probably one of the largest nuggets ever found in eastern America. Many of the nuggets exhibited were nearly pure gold. The gold had a crystalline structure, and was of fine yellow color. It was stated that in the district of North Carolina whence these nuggets were taken, gold was very abundant. The larger specimens were found in the gulleys, where they had been washed out of the decomposed rock, and it had been stated that a shovelful of dirt dug out of the hillsides anywhere in this vicinity would pan out traces of gold. Some years ago one man took out of a hole sixteen feet square $30,000 worth of gold. The quartzite containing the gold occurs in a white clay or decomposed schist.

DECEMBER 11.

The President, Dr. LEIDY, in the chair.

Thirty-three persons present.

On Extinct Rhinoceri from the Southwest.—Professor COPE exhibited the skull of a young rhinoceros, probably of the species *Aphelops fossiger* Cope, from the Loup Fork Bed of the valley of the San Francisco River, New Mexico. He also exhibited photographs of a mandibular ramus of a young rhinoceros, sent him by Dr. Mariano Barcena, of the City of Mexico. The ramus had been exhumed in the State of Mexico, and apparently belonged to a young individual of the *Aphelops fossiger*, but is of relatively small dimensions. Prof. Cope regarded the discovery as proving the existence of the Loup Fork formation at that locality.

A Fungus infesting Flies.—Prof. Leidy directed attention to a vial filled with flies adherent to fragments of leaves. He stated that on the first of August, the last summer, he had noticed that from the swarm of flies that were attracted by the ripe fruit of a black mulberry, *Morus nigra*, many settled on the under side of the leaves, and there became fixed and died from the invasion of a fungus, in the same manner as the house-fly often becomes attached to walls and window-panes, in the autumn, through the agency of the fungus known as the *Sporendonema.* The infested flies on the mulberry-tree were so numerous, that perhaps a fourth of the foliage of the lower boughs had from one to half a dozen of the flies adherent to each leaf. The fly, though a familiar one, is unknown by name to him. It resembles the house-fly, but is larger and has a black abdomen with lateral whitish spots. The fungus, of a fuscous hue, is especially evident in the extended intervals of the segments of the abdomen, along the sides of the thorax and at the neck. Though extending to and attaching the flies to the leaves, the specimens do not exhibit the zone of spores on the leaf as commonly seen in those of infested house-flies. Microscopic examination exhibited a similar structure of the fungus to that of the *Sporendonema* or *Empusa muscæ.* It mainly consists of translucent cylindrical, straight or somewhat tortuous rods or tubes of variable length with rounded ends, and containing homogeneous liquid with rows of oil-like globules. Mingled with the tubes are numerous oval, ovoid, and pyriform spore-like bodies, usually each with two oil-like globules. The spore-like bodies measure 0·028 to 0·036 mm. long, by 0·016 mm. thick. The longer tubes measure usually up to 0·16 mm. long, by 0·012 mm. thick.

On Manayunkia.—Prof. Leidy made some remarks on a specimen of *Manayunkia*, of which he exhibited a drawing, and which had been recently obtained by Mr. Edward Potts, from the mill-pond of Absecom Creek, at Absecom, N. J. It was of especial interest as apparently confirming the fresh-water habit of a cephalobranch annelide. The worm was contained in a tube attached to the midrib of a decayed leaf, to which there were attached several similar but empty tubes about one line long. The worm, 1·5 mm. long, appears to be an immature form of *Manayunkia speciosa.* The body consists of ten setigerous segments succeeding the head. The latter supports two lophophores, each with ten tentacles, of which none are conspicuously larger than the others. A pair of eyes occupy the head, but no pigment spots exist along the base of the tentacles. The podal setæ are from two to four, but mostly three, on each side of the segments. The podal hooks, but one on each side of the setigerous segments, except the first of the latter, which has none; and the last two, which have rows of six comb-like hooks on each side. The worm is translucent white, and the blood very pale green.

Ordinarily, Absecom pond is purely fresh water, and contains in abundance the usual plants and animals characteristic of fresh waters. Mr. Stuart Wood stated that in occasional extreme high tide of Absecom Creek, the pond had been subjected to the overflow of salt water.

How a Carpenter Ant Queen founds a Formicary.—Rev. Dr. McCook presented three specimens of fertile queens of the Pennsylvania carpenter ant, *Camponotus pennsylvanicus.* These had been given him by Dr. Joseph Leidy, who had taken them during the last summer at Wallingford, Delaware Co., Pa. The circumstances under which they were captured afforded a good demonstration of the manner in which a new colony of this and other species is begun, confirming the speaker's own observations and published statements. One specimen was taken, August 9, in a chestnut log; the others, August 14, in the stump of a chestnut-tree. They were enclosed within small cavities about an inch in diameter, and, curiously, the queens had sealed themselves within their nests by closing up the original opening by which they had entered, and from which, as a nucleus, they must have cut out their resident-room and nursery. If, therefore, they sallied forth to obtain food, as they may have done (for Dr. McCook had at various times observed queens wandering solitary), they must have removed the plug or "door," and restored it to place again upon re-entrance. However, he believed it to be quite within the bounds of probability that a well-fed queen could live without additional food for several weeks—a period long enough to rear a small brood, and also feed the larvæ from the contents of her crop, which might serve as a storehouse of food, as was explained by illustrations of the anatomy of the alimentary canal.

In the same receptacle with the queens were found (1) the white, oval or cylindrical eggs of the species; (2) larvæ of various sizes, from those just escaped out of the egg (2·3 mm. long) to full-grown (about 10 mm.); (3) the cocoons, or enclosed pupæ; and in one case (4) a callow antling, which had evidently just escaped from its case. This antling was, as indeed all the larvæ and cocoons appeared to be, of the dwarf caste. There are three castes in a formicary of *Camponotus*: the worker-major, the worker-minor and the minim, or dwarf. We may infer that the latter caste is the one which is first produced in rearing a family.

In response to a remark and suggestion made that the imperfect nurture given to the larvæ, under the peculiar circumstances, might account for the appearance of small workers first in order, Dr. McCook stated that, whatever one might conjecture to have been the fact in the remote origin of these castes among ants, it is certain that when the formicary has been fully peopled with workers, and the food-supply is unlimited, the several castes still continue to appear. Minims, minors and majors not only abound among the mature insects, but are found among the larvæ and cocoons. These distinctions are a permanent feature of the ant economy; and while it is perhaps not permitted one to say that they are *not* caused by differences in amount or character of the nurture given in the larval state, yet this did not seem at all probable to the speaker. The fact that, in some genera, the workers have also remarkable differences in structure (as of the head, for example, in *Pheidole* and *Pogonomyrmex crudelis*) goes to show that differentiation into castes is regulated by something other than the food-supply.

The above observations are valuable as proving that the females of *Camponotus*, when fertilized, go solitary, and after dispossessing themselves of their wings, begin the work of founding a new family. This work they carry on until enough workers are reared to attend to the active duties of the formicary, as tending and feeding the young, enlarging the domicile, etc. After that, the queens generally limit their duty to the laying of eggs, and, as the speaker had elsewhere fully described,[1] are continually guarded and restricted in their movements by a circle of attendant workers, or "court."

The above facts are further illustrated and enlarged by a series of observations made by Mr. Edward Potts, in accordance with the speaker's suggestions and directions. On or about June 16, Mr. Potts captured a queen of *C. pennsylvanicus* running across his parlor floor, late at night. He placed it in a bottle, but forgot to examine it until five days later (21st and 22d June), when he was surprised to find that the ant was alive, and had laid six or eight eggs in the otherwise empty bottle; which eggs, in their various stages of development, she continued to attend for about fifty days. He fed the ant by dropping into her bottle a pinch of white sugar, which he moistened every evening with a drop or two of water; at which times she quit her otherwise unremitting watch over the eggs and the larvæ, to press her labium for a moment into the sweet fluid, her labial and maxillary palps meanwhile rapidly vibrating with pleasure. The egg-laying was, from the first, very deliberate; one or two eggs were added to the original stock from time to time, until about the 15th August, making the highest number counted, of all ages, nineteen.

He did not observe the date of the first hatching, but these larvæ, at first no larger than the eggs, and only distinguishable upon close observation by the slight grooves between the body segments and the ill-defined head, gradually at first, and afterwards more rapidly, reached finally a length of about one-quarter inch and began to spin their cocoons. On the morning of July 20, the first was surrounded by a single layer of web, but could still be seen working inside it. By evening the cocoon was too opaque to be seen through. On the morning of the 21st the second larva was covered in like manner, and the third by the evening of the 22d. For some days he was able to detect the dark form of the young ant in one of these cocoons, and on the evening of Aug. 11 a worker was running about the bottle and already essaying its ministrations upon the undeveloped eggs and the next series of larvæ, quite as big and much heavier than itself. We have, then, the period from, say June 20 to July 20 (thirty days), occupied in the development of the first eggs and the fulfilment of the larval stage; from July 20 to August 11, say twenty-two days, were spent in the pupa state.

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[1] Proceed. Acad. Nat. Sci., 1879, p. 140; "Agricultural Ants of Texas," p. 144; "Honey and Occident Ants," p. 41.

The manner of the young worker was very nervous and far from soothing, especially to the well grown larvæ, who evidently much prefer a mother's care to that of an elder sister. He did not observe this antling feeding from the sugar, but upon one or two occasions saw osculatory advances towards its mother which seemed to indicate that it was not above receiving its nutriment from the maternal fount to which it became accustomed during its wriggling youth. It constantly climbed over the eggs and larvæ, apparently nipping them with its mandibles, but not moving them to any purpose. He saw no well-defined attempt at feeding them on its part; though, after patient observation, upon several occasions, he observed this act performed by the parent ant. She would caress the larva by sundry pats with her antennæ upon each side of the face, when, if hungry, it would lift up its head under her mandibles, placing its labium against hers, at which time a flow of liquid down the larval throat was seen.

As the queen's labors increased, she was less given to moving her charges from place to place, though they were not allowed to remain long quiescent. While nervously anxious about them, Mr. Potts thought that she showed little evidence of tenderness in her treatment, trampling on them with her feet or dragging them around under her heavy abdomen, as if they were really the putty they looked like.

The moisture necessary for the cleansing and growth of the larvæ was apparently supplied from the tongue of the caretaker, who examined them one after another, moistening the dry places and keeping the egg and larval skins flexible. The queen was very careful of the eggs, standing nearly all the time with her head over the little heap, occasionally picking them up to move them a quarter of an inch or more to one side. She was thrown into a great excitement of solicitude when a fly, attracted by the crumbs, intruded within her domicile. She sprang fiercely at the fly and raged around her narrow compartment, seizing a group of eggs as if to escape with them from a threatened danger, then replacing them as though recognizing the impossibility of getting away. Her demeanor on this occasion indicated strong maternal solicitude.

Mr. Potts made some attempt to follow the embryonic changes, and made a few drawings of the different phases. When first seen the egg is full of fluid, uniform in appearance throughout. When next observed segmentation had taken place and advanced to the morula stage, showing everywhere small granular cells of uniform size. Afterward a hyaline spot appears at one end of the egg, which there seems empty or filled with a homogeneous fluid; next to which are large cells, containing smaller ones of various sizes. Later both ends become transparent, the large cells bounding the small-celled body-cavity and forming the well-known gastrula condition. He was not able to trace the formation of the various internal or external organs. The cyclosis or pulsation of the larval heart was counted in two instances at 45 and 50 per minute.

The manner of ovipositing (August 13) the nineteenth egg is thus described: When first observed the queen stood up high upon all three pairs of legs, the abdomen thrown forward between them and the head bent back almost to meet it. The egg was then about half protruded. Considerable muscular action was visible throughout the abdomen, and when presently the egg was posited she straightened herself out with a visible air of relief, but forgot all about the egg, which was left lying under her for several minutes while she attended to other matters, until at last, accidentally touching it with one antenna, she picked it up and carried it to the family apartments, where, presently, the worker found it and placed it in the group of the older eggs. An evident intent at classifying the eggs and larvæ was remarked, these (within the narrow limitations of the chosen space) having been kept to a good degree separate.

August 13, another worker was released from its cocoon. Mr. Potts did not see the act, but believed that the female assisted, as she was seen standing over the neophyte who seemed to be weak, its femora bent forward, the tarsi and tibiæ still nearly reaching the end of the abdomen, indicating the manner in which the legs were folded in the cocoon. Immediately after release the mother gave the young imago nourishment in the manner above described.

At this date there were in the formicary, beside the mature ants, two full-grown larvæ, very fat, two about half-grown, and several smaller ones, with the eggs in different stages of development. The two oldest were then evidently about ready to spin, but what chance they could have, with the mature ants continually tramping over them, standing them up on end or hauling them off to a distance, Mr. Potts was at a loss to imagine. From the mouth of one he observed a strand of silk protruding, but the workers came, apparently trying to grasp it, and left him in doubt whether their object was to help or hinder the weaving process.

August 14, one of the two full-grown larvæ was found wrapped in its winding sheet. The web was very thin and the motion of the larvæ readily seen through it. The other larva seemed almost totally quiescent, but careful examination with a Coddington lens showed some muscular action in the posterior segments of the body. Their state of comparative torpor was thought to immediately precede the act of spinning. At this date the workers had become less nervous in their motions, and the female seemed to have resigned most of her labors to them, resting much of the time quietly in one place.

August 16, the third worker had emerged and was found quite at home in attending to its duties. The second grown larva was then still uncovered and quiescent. Very close observation was required to show that it still breathed, and it made no other visible motion.

These observations of Mr. Potts establish or confirm the following points: (1) The manner of depositing the eggs, which, as well as the larvæ, are cared for by the queen until workers are matured; (2) the stages in the development of the egg and larvæ are partially noted; (3) the time required for the change from larval to pupal state is about thirty days; (4) about the same period is spent in the pupa state, the entire period of transformation being about sixty days; (5) the work of rearing the first broods of *Camponotus* begins the latter part of June or early in July; (6) about twenty-four hours are spent by larvæ in spinning up into cocoon; (7) the ant queen probably assists the callow antling to emerge from its case; (8) not only the larvæ, but occasionally also the antlings, are fed by the queen; (9) the young workers, shortly after emerging, begin the duty of nurses, caring for the eggs and tending the larvæ. Some of these points thus abstracted and formulated by him Dr. McCook was subsequently able to confirm from observations upon the same queen. His thanks were due Mr. Potts for the intelligent and successful manner in which his suggestions had been carried out.

The following was ordered to be printed :—